AGRICULTURAL NEWS LETTER

VOL. 5 - NO. 4 APRIL, 1937

This publication gives information on new developments of interest to agriculture on laboratory and field investigations of the du Pont Company and its subsidiary companies.

In addition to reporting results of the investigations of the Company and its subsidiaries, published reports and direct contributions of investigators of agricultural experiment stations and other institutions are given dealing with the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

Vol. 5 - No. 4 April 1937

This issue contains:

NEW FACILITIES FOR RESEARCH IN FIELD OF FUNGICIDES BY BAYER-SEMESAN COMPANY WILL BE AVAILABLE SHORTLY

EDITOR'S NOTE:- The new laboratory for seed treatment and other research in connection with fungicides, announced here, will not only add to the present facilities of the Bayer-Semesan Company, but will also enable the laboratory and field investigators to cooperate more satisfactorily with federal and state agencies engaged in studies for control of plant diseases. Bayer-Semesan Company is an affiliate of E. I. du Pont de Nemours & Company, and the Winthrop Chemical Company.

The Bayer-Semesan Company has acquired 26-acres of land at Minquadale, near Wilmington, Delaware, as a site for a new laboratory and other structures, and an experiment farm. This plant will be used for scientific research and experiments in the field of seed disinfectants and other fungicides.

Plans have been made for a laboratory with offices for research workers, a greenhouse, a head house or general work room, and a farm implements building. The laboratory facilities will include chemical equipment, ovens, incubators, autoclaves or steam sterilizers, and the like.

Gilbert F. Miles, chief plant pathologist of the Bayer-Semesan Research Department, will direct the work of a staff of professionally-trained investigators and a group of non-technical assistants.

Expansion of Research Program

Establishment of the new laboratory and test farm represents an expansion of the research program begun more than ten years ago, which has resulted in valuable additions to the list of remedies for many diseases of grain, cotton, corn, vegetables, and other crops. The present plan calls for a continuation of these studies with the hope of developing fungicides applicable to the control of plant diseases for which the present control measures are inadequate or entirely lacking.

CERTAIN TECHNICAL ASPECTS OF "FREON" REFRIGERANTS OF INTEREST IN RELATION TO REFRIGERATION RESEARCH

EDITOR'S NOTE:- This is the second, and concluding, section of a paper of the above title. The first section appeared in the March issue of this publication. A previous paper by Mr. Thompson on the subject of "Freon" refrigerants attracted wide attention among those doing refrigeration research, as was evident from the many inquiries received.

By R. J. Thompson,
Refrigeration Engineer,
Kinetic Chemicals, Inc.,
Wilmington, Delaware.

The volume per pound of a refrigerant vapor and the Btu. refrigerating effect per pound of liquid refrigerant will determine the displacement that must be handled by the compressor.

When plotting boiling point of a refrigerant at atmospheric pressure against cubic feet displacement required for a known refrigerant under standard ton conditions, it will be found that a very smooth curve may be drawn through those points. From this curve, displacement required for proposed refrigerants may be predicted to a very high degree of accuracy. From this curve it is also possible to determine the type of compressor, whether reciprocating, rotary or centrifugal that will best handle the volume of vapor required. In other words, the type of compressor to be used will be related to the boiling point of the particular refrigerant and also to pressures that will exist on the high and low sides of the system. It is true, of course, that pressure is a very important factor to take into account, but it must be remembered that pressure has a direct relationship to boiling point.

Within the range of normal operating conditions, the reciprocating type compressor is successfully used for refrigerants having boiling points of less than 15°F.; the rotary type compressor with refrigerants having boiling points ranging from 10 to 75°F. and the centrifugal type compressor with refrigerants having boiling points of higher than 70°F. Another manner of stating this is: The reciprocating type compressor is best adapted to refrigerants producing positive pressures; the rotary type compressor is best adapted to refrigerants operating at or near atmospheric pressures and the centrifugal type compressor is best adapted to refrigerants which must be handled under negative pressures. Therefore, "Freon-12" is most efficiently used in reciprocating type compressors, "Freon-114" and "Freon-21" are most efficiently used in rotary type compressors and "Freon-11" is most efficiently used in centrifugal type compressors.

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Regardless of the fact that under standard ton conditions, "Freon-12" has a relatively low refrigerating effect per pound or less than 1/9 that of ammonia which has the highest Btu refrigerating effect, the piston displacement of a "Freon-12" compressor is only 69% greater. The Btu refrigerating effect of "Freon-12" is approximately 1/3 that of methylene chloride, sulfur dioxide or methyl chloride; although, a "Freon-12" compressor has a piston displacement of 92%, 36% and 5% less, respectively.

The piston displacement per ton is only one of many factors used in determining the design of refrigeration apparatus and the selection of a refrigerant and must not be confused with horsepower or floor space requirements.

It is possible to use present equipment in certain and exceptional cases, provided proper cognizance is given to the new Btu capacity, piston displacement, pressure control mechanism, regulating valve orifice size, lubrication, gas velocity, manifolding, etc., but certainly it should not be considered good design. Obviously, it would be poor engineering to attempt to use ammonia in a carbon dioxide designed system or vice versa, but in another case with only slight engineering or design changes, "Freon-12" may be substituted for methyl chloride.

VOLUME REFRIGERANT CIRCULATED

The Btu effect per pound and the volume per pound of liquid refrigerant determines the volume of liquid refrigerant to be evaporated to obtain the desired refrigerating effect and capacity. A liquid refrigerant must not be judged only by its refrigerating effect per pound, whether it be high or low, as the volume per pound must also be considered to determine the actual cubic inches of refrigerant to be passed through the liquid line and the regulating valve orifice.

As mentioned previously, "Freon-12" has a relatively low refrigerating effect and a low volume per pound, but when the correct calculation has been made it will be found that all that is necessary is to circulate a larger volume of liquid refrigerant through the regulating valve to produce the required amount of refrigeration. This is not a disadvantage, in fact, it is a decided advantage to circulate large volumes of liquid refrigerant, as a greater volume will permit the use of less sensitive, more accurate and more positive operating and regulating mechanisms with less critical adjustment.

Refrigerants with high Btu refrigerating effect are not desirable for household or small commercial systems, due to the difficulty that is encountered in accurately metering the flow of such small quantities of liquid through the regulating valve. For those small capacity machines, the adjustment of a regulating valve opening is almost microscopic in size, when using refrigerants with high Btu values.

The Btu refrigerating effect per pound of "Freon-12" is approximately 1/3 of that for methyl chloride and sulfur dioxide, while the volume of liquid refrigerant through the orifice of the regulating valve is approximately twice that

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for methyl chloride and approximately three times that for sulfur dioxide. This means that the area of the orifice of a "Freon-12" regulating valve will be approximately twice that of a methyl chloride valve or three times that of a sulfur dioxide valve. The larger the size of the orifice, the less possibility of dirt, scale or ice crystals lodging in the opening and interfering with the correct flow of liquid refrigerant. Furthermore, it has been found much simpler to throttle or meter the liquid through the larger opening and in that manner accurate adjustment of the regulating valve maintained.

PRESSURES

Complete tables of the thermodynamic properties of "Freon-12" have been published for some time and tables on other members of the "Freon" family will also make their appearance when there is a field for their commercial application.

Operating head pressures for "Freon-12" systems will vary with the temperature of condensing medium, whether an air or water cooled condenser is used, design and condition of the condenser, operating back pressure, superheat from the compressor and other factors. Such pressures that may be observed will correspond to a temperature of approximately 10 to 12°F. higher than the corresponding temperature of condensing medium for a good design of water cooled system and possibly 25°F. higher than the condensing air temperature for small household machines, depending upon air circulation.

The low temperature of adiabatic compression for "Freon-12" requires less condensing service for the removal of superheat than is needed for other refrigerants that have been commonly used in the past.

Water jacketed cylinders and valve plates are not required for "Freon-12" compressors, even of the larger sizes, as the heat of compression may be dissipated by means of integrally cast fins. Elimination of water jacket cores and piping will materially reduce the loss in castings and the cost of machining castings.

Pressure temperature tables or curves may be used within close limits for determining settings for low pressure control mechanism or expansion valve operation, even though the mineral lubricating oil used in the system is miscible with the refrigerant. The "Freon-12" in the evaporator which will contain from 5 to 10% oil under normal operating conditions of air conditioning or commercial work, will raise the boiling point of the mixture approximately 1 to 2 degrees or require that the back pressure be lowered approximately 1 to 2 pounds, in order to maintain the same temperature.

DENSITY

"Freon-12" vapor is more dense than other commonly used compressed gases used as refrigerants, with the exception of carbon dioxide, and as a result such a system must be designed so that the "Freon-12" gas velocity may be reduced to as low a figure as possible, so as to avoid excessive pressure drops without reducing the operating efficiency.

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Consideration must be and has been given to the elimination or reduction of pressure drop as compared to the high velocity previously found satisfactory with other refrigerants. The lower gas velocity for "Freon-12" causes the redesign to intake and discharge valves, shape of port areas, pipe lines, service valve, fittings, connections, elimination of all sharp corners, etc. Today manufacturers using "Freon-12" proudly point to the fact that they have reduced gas velocities to approximately 15 to 25% below the velocities which we originally suggested, which were about 15 to 20% below the velocities permitted with other refrigerants, excepting carbon dioxide. To have accomplished this without increased valve noise or cost of manufacture is a design achievement of which the industry may be proud.

Many tables and curves of recommended sizes and velocities for various load conditions have been prepared and made available to the industry.

Not only density, but viscosity, thermal conductivity, Reynolds number, etc. should be the bases of good engineering design. But in addition such factors as solvent action of the refrigerant on oil, greases, binders, oxide, surface weighing characteristics, methods of manifolding and many others must be taken into account, none of which must be overlooked or disregarded.

GRAVITY

The specific gravity of "Freon-12" liquid is 1-1/2 to 2-1/2 times greater than for other commonly known refrigerants, with the exception of sulfur dioxide, "Freon-11", "Freon-21", "Freon-114" and approximately the same as for methylene chloride. However, consideration must be given to the fact that from 5 to 10% oil will be present in the "Freon-12" and the specific gravity of the "Freon-12" must be considered for float valve design of the correct weight and buoyancy for proper control of liquid regulating valve. Such floats would be similar in design to methylene chloride.

LUBRICATION

The lubrication of a "Freon-12" charged compressor is very similar to that of a compressor using a refrigerant such as, methyl chloride, ethyl chloride, isobutane or methylene chloride, which in the liquid phase are miscible with mineral lubricating oil.

"Freon-12" absorbs small quantities of mineral lubricating oil, depending upon the pour point and viscosity, temperature of oil in crankcase or bearings and operating back pressure, but unlike other refrigerants, except those mentioned above, do not deposit the mineral oil in the low side of the system unless proper design has been overlooked. Proper ebullition and circulation within the evaporator will cause the return of mineral lubricating oil to the compressor.

The lubricant to be used in "Freon" charged compressors should be a straight-run and properly refined mineral oil and must not contain water, sediment, acid, soap, resin or any substance not derived from petroleum. Practically all of the oil refining companies are in a position to supply mineral lubricating oil of a refrigeration grade and of the proper characteristics.

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The use of glycerin, ethylene glycol or castor oil is not recommended as those compounds are highly hygroscopic and in addition have a tendency to become gummy or produce a sticky sludge in the compressor when the system is idle or when the lubricant is heated.

Refrigerants that are soluble in mineral lubricating oil will provide for the most efficient lubrication of all moving parts of the compressor and at the same time provide for proper return of oil from the evaporator to the compressor. Miscibility with proper oil return is to be preferred to immiscibility with oil logging in condensers and evaporators which require purging periodically.

Mineral lubricating oil must be thoroughly dehydrated not because of any chemical reaction, but for the reason that any moisture in the oil will freeze out and thus, restrict the flow of refrigerant through the regulating valve and also, possibly cause emulsification and sludging of the oil.

Use only the oil supplied and/or recommended by the manufacturer of the compressor.

A number of very interesting and valuable articles on the subject of Lubrication as applied to refrigeration equipment in the air conditioning and refrigeration industry have been prepared by the Texas Company during the past few years.

HORSEPOWER

The theoretical indicated horsepower per ton of refrigeration is substantially the same for all refrigerants, with the exception of carbon dioxide, and such data will be found in the A.S.R.E. Refrigerating Data Book, 1937-38.

Brake horsepower figures for compressors using different refrigerants should not be used to compare an ammonia machine designed and refined over the past 50 years with a "Freon-12" charged compressor originally designed for some other refrigerant. By looking at brake horsepower figures of "Freon-12" compressors designed and refined over the past 5 years, it will be found that the refrigeration engineers have not only profited by the 50 years experience, but have gone far ahead in promoting the arts and sciences connected with the industry. By considering brake horsepower figures for "Freon" designed and built compressors, it will be found that those figures are directly comparable with any other refrigerant regardless of how long such equipment had been engineered. Data on this subject was made available by Mr. L. Williams and Mr. L. S. Morse whose papers will be found in Refrigerating Engineering of January, July and August of 1936.

It is interesting to note that 16,697 four cubic foot "Freon-12" household units were sold to the United States Government on the basis of guaranteeing the Kwh per day. This has not only been guaranteed but proved by complete and exhaustive tests to be approximately 15% less than the next best unit charged with another refrigerant.

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MOISTURE REMOVAL

Moisture must be removed from "Freon" systems to prevent formation of ice crystals at the regulating valve, prevent oxidation, prevent intercrystalline embrittlement of brasses, prevent sludging and emulsification of oil and eliminate the possibility of shorting in the field coils of hermetically sealed compressors. Moisture may be removed by heating and evacuating units of the smaller size as has been the practice throughout the industry for years or by the proper use of a drying agent; such as, silica gel, activated alumina or anhydrous calcium sulphate.

When oven equipment is not available, we recommend that these drying agents be used in the liquid line as they have good absorption capacity and no new compounds will be formed when an amount of water in excess of the absorption capacity is present.

We do not recommend the use of calcium chloride, as the cartridges invariably are too small in absorption capacity and a brine is formed which will cause damage to the entire system.

Moisture absorption is influenced by temperature, moisture, rate of flow, size of activated absorbent capacity for absorbing moisture and size of equipment.

The miscibility of water in "Freon-12" is very low and is in the order of .0031% by weight at 0°F., .006% at 32°F. and .0165% at 80°F.

The use of basic oxides are patented, (No. 1,809,833), and their use should be investigated before attempting to make use of any of the compounds in that group.

We have never advised the use of anhydrous methyl or ethyl alcohol in "Freon" systems in order to make a non-freeze solution of any water present and prevent the formation of ice crystals at or near the regulating valve. It should be considered a better practice to remove the moisture from a system and the lubricating oil, rather than to add any new compounds, as the alcohol does not remove the water but permits it to remain in the system where the water may cause corrosion or oxidation to metal and further cause emulsification of the oil. We believe that a cure should be affected by removing the moisture from the system, rather than to merely seek relief by adding alcohol to the system.

The use of anhydrous methyl or ethyl alcohol as an anti-freeze in any refrigerating system is claimed by United States Patents Nos. 1,570,808 and 1,460,352.

FILTERS OR STRAINERS

"Freon" being an excellent solvent, has the ability of loosening and physically removing all factory dirt, oxides, scale, soldering flux, factory washing compounds, etc. that may be in a system and cause the foreign matter to be removed by the liquid or vapor and deposit the heavy particles or corrosion products placed in the system at the strainer or filter and possibly close the system. Filters of fine mesh screen of large area to provide blocking in a short time, should be provided and so designed as to be readily disassembled to permit cleaning in order to protect the compressor and regulating valves.

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DETECTING LEAKS

A "Freon" leak may be detected by means of a halide lamp which may be described as a torch - burning alcohol or a combustion gas type, which under normal conditions produces a colorless flame. A tube fastened to the base of the burner is used to conduct the air suspected of containing "Freon" vapor through the flame and over metallic copper. As the refrigerant passes through the flame a volatile copper halide is formed and the flame color changes from the normal colorless to a bright green, if the air contains as much as .01% of "Freon." Such a leak is equivalent to the escape of "Freon" at the rate of 1 ounce of liquid per month or 3/4 pounds per year.

The use of a halide lamp in detecting leaks of "Freon" is probably the easiest and most accurate method of positively determining minute leaks of non-flammable organic refrigerants containing chlorine and fluorine, and the response to the test is instantaneous. In dark or confined locations the use of a halide lamp is obviously the only practical method of leak detection.

The "Freon" refrigerants are stable and inert, therefore, the usual visible method, called the "smoke" test, cannot be used to determine leaks as there is no known chemical compound that will react with such a refrigerant to produce a visible vapor.

As to the advisability of adding chemicals to "Freon" charged systems in order to give warning of a leak of refrigerant, let it be said, quite definitely, that it is the unanimous opinion of the chemists, engineers and manufacturers who are connected with this problem, that although several substances may serve the purpose of a good warning agent in some respects, each warning agent has some very undesirable and objectionable properties. There is no warning agent that will properly serve such a purpose. Therefore, it is considered inadvisable to use irritants or odorants in connection with "Freon" charged systems, as the advantage of using a safe and panic free refrigerant would be more than offset, as such warning agents would undoubtedly serve as a means of starting a panic.

The use of soap and water, odorants or irritants or chemicals to produce reactions for a "smoke" test are not recommended.

TESTING LINES

After hard copper and sweat fittings or welded pipe in suction and liquid lines have been erected, the lines should be tested under pressure with nitrogen or dry carbon dioxide gas before any refrigerant is added to the system. The test pressures are not to be used in the evaporator or the compressor when soft copper tubing is used in suction and liquid lines. During time of test the valves to the compressor and evaporator must be closed tight to prevent building up of excessive test pressures on the units that have already been tested in the factory.

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The drum containing nitrogen or dry carbon dioxide should be equipped with a pressure reducing valve to prevent higher pressures than those required by the local code authorities, or pressures higher than the lines were designed for. A pressure gauge should be installed in the line between the test drum and the suction and liquid lines for pressure checking purposes.

Build up a pressure in the suction and liquid lines to 145 to 235 pounds gauge as required by local codes by opening pressure reducing valve on the test drum, and maintain this pressure for a few minutes and then close valve. Observe the gauge reading over a period of several minutes to make certain there is no drop in pressure, which would indicate a leak. In the meantime paint all joints with liquid soap and observe presence of bubbles. Such a test will give a 100% test of fittings and connections.

When satisfied that the system is tight, discharge the lines of test gas, evacuate system of test gas, open all valves, charge system with "Freon-12", build up pressures and test all possible sources of leaks by means of a halide leak detector.

Dry carbon dioxide or nitrogen are recommended for use in testing for leaks. Do not use oxygen as a substitute for nitrogen, dry CO_2, or for compressed air, as a serious accident may easily result if the oxygen should come in contact with oil or grease.

HANDLING THE REFRIGERANT

It is not necessary to discharge "Freon" into a water or an alkali solution when disassembling or servicing an installation. "Freon" may be discharged into the atmosphere, as no damage will be caused to any materials being stored in the refrigerator or no injury or damage to flowers, plants, shrubbery or possibly family pets.

"Freon-12" should be discharged slowly so that the liquid refrigerant be permitted to vaporize before it comes in contact with any materials, in order to eliminate the possibility of freezing. Of course, "Freon-12" may be pumped down or discharged into clean containers for reuse.

Inasmuch as "Freon-12" is non-irritating and non-toxic, it will not be necessary to wear a gas mask when servicing such equipment, however, it is essential that proper protection be afforded the eyes by the use of goggles or large lensed spectacles to eliminate the possibility of liquid "Freon-12" coming in contact with the eyes and causing possible injury due to the freezing of the moisture in the eyes.

Should liquid "Freon-12" come in contact with the skin the injury should be treated as though the skin had been frost bitten or frozen.

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SUMMARY

"Freon-12" has a boiling point of -21.7°F. at atmospheric pressure. It is a colorless, almost odorless even in high concentrations, non-irritating, non-toxic, non-flammable, non-explosive, non-corrosive refrigerant and has ideal chemical, physical and thermodynamic properties, and used most efficiently in reciprocating type compressors.

"Freon-12" charged compressors are small in size, light in weight, operate at low but positive pressures and use commercially available mineral lubricating oil. The manufacturer of refrigerating machinery has a wide selection of materials and metals for efficient design, as the refrigerant permits of simplicity of construction, great flexibility of application, high operating efficiencies, quietness of operation and will permit of a low initial and ultimate cost.

Paper presented before the New York Section
The American Society of Refrigerating Engineers
January 28, 1937

CONTROL OF DAMPING OFF OF COTTON IN NORTH CAROLINA BY DISINFECTING SEED REPORTED BY EXTENSION SERVICE

EDITOR'S NOTE:- This article appeared under the title of "Why and How to Treat Cotton Seed" in Plant Disease Notes, a publication of the North Carolina Agricultural Extension Service.

By Luther Shaw,
Extension Plant Pathologist,
University of North Carolina,
Raleigh, North Carolina.

Failure to obtain a good stand of cotton robs North Carolina cotton farmers of approximately 150 million pounds of seed cotton annually. Very few growers escape bearing a portion of this loss because the condition is general throughout the State. There are several conditions or factors which may, either individually or collectively, cause poor stands. Outstanding among these factors is damping off.

Damping off is a diseased condition caused by parasitic germs (fungi and bacteria). These germs are carried on the cotton seed and are present in practically all soils. When weather conditions are suitable, the germs attack either the ungerminated cotton seed in the ground or the young seedling and cause decay. Attack of the seed in the soil frequently prevents germination. Attacks after germination cause either stunting or death of the young seedling.

Extensive studies have been made of a wide variety of seed treating materials in an effort to find one that would eliminate the damping off disease as a cause of poor stands of cotton. Results of these studies show that treating cotton seed with 2% ethyl mercury chloride dust 1/ will give practical control of the disease.

1/ Now sold under the trade name of 2% Ceresan.

Some Results From Seed Treatment

The control of damping off of cotton by seed treatment with ethyl mercury chloride dust was studied on sixty-seven farms distributed through eleven counties in North Carolina during the season of 1936. On each farm treated cotton seed, varying in quantity from one to 1200 bushels, was planted and compared with untreated seed planted in the same field with respect to (1) stands obtained, (2) damage to plants by damping off fungi and bacteria, and (3) yields of lint and seed.

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TABLE I. Results of Tests on the Control of Damping Off of Cotton by Seed Treatment of 67 Farms in North Carolina during the Season of 1936

Factors Measured	Seed Not Treated	Seed Treated
Average number of plants that emerged per 100 ft. of row	248	416
Average number of plants attacked, but not killed by damping off fungi and bacteria	78	10
Average percentages of plants killed by damping off fungi and bacteria	9	1
Average number of plants per 100 ft. of row at picking time	106	137
Average yield of seed cotton per acre in pounds	1295	1548
Average value of lint and seed in dollars per acre 1/	$68.36	$81.71

1/ Lint valued at $12.00 per hundred and seed at $30.00 per ton.

Results of these tests show (Table 1) the following advantages in favor of treated seed: (1) a 30 per cent increase in emergence of plants, (2) 780 per cent decrease in infection and 900 per cent decrease in death of plants from infection by damping off fungi and bacteria, (3) 23 per cent increase in the final stand of plants and (4) a 16 per cent increase in the yield and value of the lint and seed. The average cost of treating cotton seed for the 67 tests was 27¢ per acre, including both material and labor. Hence, an increased return of $13.08 per acre was obtained from seed treatment in the tests.

It was evident in the tests conducted during the season of 1936, that the increase in yield from seed treatment was due primarily to the better stand of the plants obtained from treated seed. It was, however, a general observation that the plants from treated seed grew more rapidly, especially during the early stages and matured bolls earlier than did the plants from untreated seed. This condition apparently caused a part of the increase in yield.

How to Treat Cotton Seed

1. Treating Material: The best known material for treating cotton seed for the control of damping off, is 2% ethyl mercury chloride dust (now sold under the trade name of 2% Ceresan, and can be purchased in practically all areas of the State through the local seed dealer, hardware store, or drug store).

2. Amount of Dust to Use: Use the 2% ethyl mercury chloride dust at the rate of 3 ounces per bushel of seed.

3. How to Apply the Dust: The most satisfactory type of machine for treating cotton seed under average farm conditions is the barrel duster. (Figure 1)

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Such a machine is inexpensive and can be built either on the farm or by any local blacksmith. Under average conditions two people can treat from 20 to 40 bushels of seed per hour with this type of machine.

Treating the seed is very simple: Fill the barrel about one-half full of cotton seed, add the correct amount of dust, close the door to the mixer, and rotate the barrel for approximately 5 minutes. Remove the seed from the dusting machine and store in bags or bins until planting time. Cotton seed can be treated at any time during the winter months and stored until planting time without danger of injury to the seed.

4. Caution: Ethyl mercury chloride is poisonous and care should be taken not to breathe an excess amount of the dust. It is advisable to wear a dry cloth or dust mask over the nose and mouth while treating seed. Breathing of the dust can be kept to a minimum by treating the seed out in the open or in a well-ventilated room. Treated seed are poisonous, and if an excess amount is treated, they should be disposed of in such a way as to avoid consumption by man or animals.

5. Cost of Seed Treatment: The cost of seed treatment per acre of cotton planted will vary with the volume of dust purchased and the rate the seed are sown. However, under average conditions, the cost will be approximately 25¢ per acre. Treated cotton seed can be safely seeded at the rate of four to five pecks per acre. Farmers who have been seeding at higher rates can reduce the rate of seeding and save the cost of seed treatment in seed.

Conclusion

Cotton seed treatment is simple, and inexpensive. It is the only practical way of insuring cotton against poor stands resulting from damping off. Therefore, cotton farmers of North Carolina are urged to adopt seed treatment as a standard procedure.

"Ceresan" is a trade name registered in the U. S. Patent Office by the Bayer-Semesan Company, Wilmington, Delaware.

LABORATORY REARED FLIES ARE HARDIER THAN WILD ONES FEDERAL FOOD AND DRUG ADMINISTRATION TESTS REVEAL

EDITOR'S NOTE:- the results reported here on tests of the relative hardiness of artifically hatched and reared house flies and wild ones should serve to settle a somewhat moot question. Some entomologists are of the opinion that other insects incubated in laboratories for experimental purposes are, at least, as sturdy as those hatched in the open. Possibly, it will be found that "tame" insects are hardier.

Freedom and life in its natural environment does not make a house fly hardier than a fly hatched in the laboratory and reared under controlled conditions in a fly nursery. The laboratory reared fly is the hardier, Federal scientists have found as by-product information developed in practical tests of fly-killing sprays.

The Food and Drug Administration tests these preparations to find out whether they are really as good as the claims on the labels say they are. Many of the commercial fly sprays are solutions of pyrethrum flowers in kerosene. Some farmers--particularly dairymen--prefer to make their own sprays from the same materials.

To test the spray, the investigators release about 100 flies in a small room. They spray a standard quantity of spray into the room, and after a specified number of minutes, count the paralyzed flies and the active flies. After 24 hours they count the dead and the living flies. The average of several tests gives a reliable score for the preparation.

In summer it is often practical to make one of the tests with wild flies and another with flies raised for the purpose in the laboratory. As a rule, a fly spray will kill from 10 to 15 percent more wild flies than tame. Superior resistance of the laboratory reared insect is an advantage because this makes it practical to test a spray at any season. If the spray will knock out the tame flies, the product is fairly certain to be effective if used as directed in homes or in dairy barns.

EXCESS OF MOISTURE IN SOIL IN PARTS OF THE COUNTRY LIKELY TO REQUIRE THAT DITCHES BE PUT IN CONDITION

EDITOR'S NOTE:- In view of the fact that reports from various sections indicate that drainage systems on many farms are in bad condition, agricultural engineers see possible danger to crops where soil moisture is in excess of normal. Heavy rainfall, it is pointed out, could delay planting or cause considerable damage after crops are in the ground.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.,

A release from the Press Service, United States Department of Agriculture, dated March 10, sets forth facts of interest and importance to farmers and also to agricultural engineers concerned with advice and assistance to farmers. This news release reads as follows:

"Spring opens with plenty of moisture in the soil nearly everywhere east of the Central Great Plains -- too much in some places. Winter snows left ample moisture in storage in most of the western mountain areas, decidedly more than last year. The greatest snow depth reported the first of March was 183 inches at Paradise Inn, Washington. The central northern states also had heavy snows, the cover being about as deep as at this time last year. The soil is still very dry, however, in the western plains from eastern Montana and Western North Dakota southward. Subsoil moisture, too short at the beginning of winter, has not been replenished in this area. With no reserves, the soil here must depend entirely on spring and early summer rainfall.

January Weather Freakish

"Except for a freakish January, winter weather for the United States averaged about normal, according to J. B. Kincer of the Weather Bureau. December was mostly warmer than normal; February temperatures were nearly normal practically everywhere. February had a tendency to dryness, but December was extremely wet over most of the eastern half of the country.

"January was abnormally warm in the East and abnormally cold in the Northwest and West. It brought unprecedently heavy rains -- followed by disasterous floods -- to the Ohio Valley, and drought -- accompanied by dust storms -- to the Southwestern Great Plains. Typical of January's freakishness was the dust that drifted out from the dry Southwest over the flooded Ohio Valley.

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"This unusual mid-winter weather, Mr. Kincer says, was the result of the strange behavior of air masses. Normal eastward movement of high-pressure (warm) and low-pressure (cold) masses was prevented by a persistent "high" stagnation over the Florida-Bermuda section. This aerial traffic blocking resulted in prevailing warm southerly winds in the East, which advanced vegetation to the danger point. At the same time the Northwest had arctic weather and California serious freezes.

"A return to orderly movements of high and low-pressure air masses in February brought winter back to approximately normal. Rainfall, however, was scanty over the interior of the country. The Ohio Valley, which in January had 400 per cent of normal precipitation, had little more than half normal in February."

Blasting Ditches in Wet Ground

Farmers and those whose job it is to assist in providing and maintaining adequate drainage will take the cue from what the Department of Agriculture reports on winter weather conditions and the excess soil moisture in certain sections.

However, ditching flooded lands or excessively saturated soil sometimes offers difficulties where the procedure is not thoroughly understood. On the other hand, such blasting is simplicity itself where the proper method is followed.

To start off, the blaster has in his favor the fact that the wetter the soil, the easier it is to blast. The thing that most seriously interferes, unless the blaster knows the "how," is loading the dynamite in mire. That, however, may be overcome by using a light plank on either side of the center line of the projected ditch to stand on and straddle the mire. As necessary, these planks may be slid along as the loading proceeds.

Holes should be loaded immediately after punching. The charges should be pushed down the holes with a wooden stick, as a safety measure.

For shooting, the propagated method should be followed. As is well known, only one cartridge of dynamite need be primed. Either a blasting cap and fuse may be used, or an electric blasting cap. In the latter case, an electric blasting machine is necessary to fire the cap. The detonation of the primed charge will set off all the others.

Working in thoroughly saturated soil, three men can load a quarter of a mile of ditch in a single day. It can be shot in sections or in a single blast.

To blast a ditch with a depth of six feet, a top width up to twenty feet and a bottom width of about five feet, loading should consist of five sticks of ditching dynamite to each hole. These holes should be 52 inches deep and spaced 24 inches apart. A single line of holes on the center line is all that is necessary. Smaller ditches can be blasted with a single row of holes loaded with one, two or three sticks of dynamite. The spacing and depth of holes would vary accordingly.

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